

## 70 Meterless Voltmeter

□ Here is a DC voltmeter that is light, rugged and, best of all, **cheap**. Instead of a meter, it uses the National Semiconductor LM3914 display driver and ten light-emitting diodes to measure voltage in five ranges. As the voltage present at the instrument's input rises above ground level, first LED1 lights, followed by LED2 and so on until, finally, LED10 comes on.

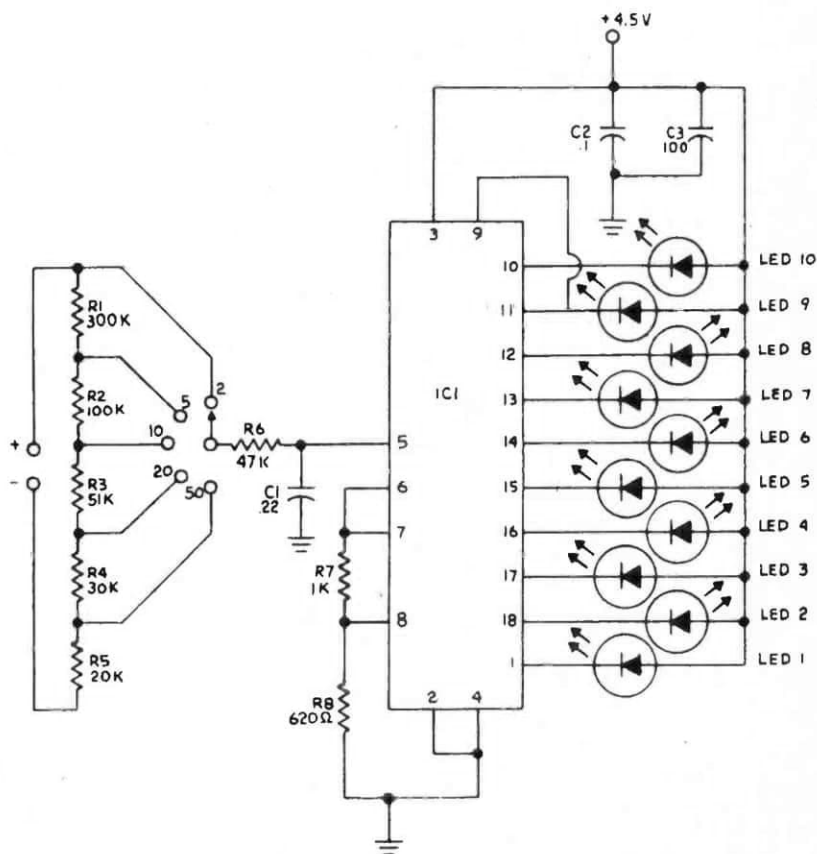
We have chosen the dot-display mode, so only one LED is on at a time. This is more energy-efficient than a bargraph display (which this chip is also capable of producing). Capacitor C1 filters

out any extraneous AC components of the input signal, thus eliminating display jitter.

Should you be inclined to absent-mindedness, take heart because you will have a tough time clobbering this meter regardless of how careless you are. Inputs as high as 100 portionately higher overloads can be tolerated on the higher voltage ranges. Full-scale sensitivities of 2, 5, 10, 20 or 50 volts DC may be selected with S1. Each LED represents a voltage increment one-tenth of full scale. Three AA cells in series can supply power for this circuit.

### PARTS LIST FOR METERLESS VOLTMETER

- C1—.22  $\mu$ F mylar capacitor
- C2—.1  $\mu$ F ceramic disc capacitor
- C3—100  $\mu$ F, 10V electrolytic capacitor
- IC1—LM3914 dot/bar display driver (National Semiconductor)
- LED1 thru LED10—light emitting diodes
- R1—300,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R2—100,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R3—51,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R4—30,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R5—20,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R6—47,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R7—1,000-ohm,  $\frac{1}{2}$ -watt 5% resistor
- R8—620-ohm,  $\frac{1}{2}$ -watt 10% resistor
- S1—SP5 ps. rotary switch



## 71 Ignition Key Alarm

□ This ignition key alarm replaces the loud, annoying buzzer in your car with a pleasing tone

of about 2000 Hertz. One section of an LM3900 quad operational amplifier is connected as a